How to

Identify and Control Stem Rusts of Jack Pine

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Forest Service
Northeastern Area
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Branches and stems of jack pine can be infected by five different rust fungi:

Pine-oak (eastern gall) rust	*Cronartium quercuum*
Pine-pine (western gall) rust	*Endocronartium harknessii*
Sweetfern rust	Cronartium comptoniae
Comandra rust	*Cronartium comandrae*
Stalactiform (cowwheat) rust	*Cronartium coleosponoides*

Damage to jack pine caused by rust fungi includes growth reduction, cankers, death (by girdling or wind breakage), and creation of entryways for other fungi and insects. Seedlings and saplings are more seriously affected than older trees (Fig. 1).

Rusts are plant diseases caused by a group of fungi that often require two different species of host plants to complete their life cycle. The fungi produce two types of spores (pycniospores and aeciospores) on the pine host and three (urediospores, teliospores, and basidiospores) on the alternate (non-pine) hosts.

Figure 1. - Elongate galls typical of sweet-fern, comandra, and stalactiform rusts (left); spherical galls typical of pine-pine and pine-oak rusts (right).

Distribution

All five stem rusts have been found in the Lake States, but only pine-oak and sweetfern rust have been reported in Maine. In Canada, pine-oak rust has been confirmed only in Ontario. The other four rusts are distributed in all Canadian provinces where jack pine grows, with only a few exceptions: stalactiform rust has not been observed in the Northwest Territories, New Brunswick, or Nova Scotia, and comandra rust is not known in Nova Scotia.

Field Identification

Rust diseases are identified by the shape and location of galls and cankers and by the presence of alternate hosts in the area. The following tabulation will aid in field identification.

Common Name	Alternate host	Seedling or branch	Main stem
Pine-oak rust (Fig. 2)	Oaks, primarily in the red oak group	Spherical galls	Spherical galls
Pine-pine rust (Fig.3)	None	Spherical galls	Spherical galls
Sweetfern rust (Figs. 4, 5)	Sweetfern and sweet gale	Elongate swellings	Wide, flat or sunken canker usually at base of tree; swollen ridges along edges of canker usually >2m long
Comandra rust (Figs. 6, 7)	False toadflax or other species of Comandra	Elongate swellings	Wide, elliptical canker usually not at base of tree; abundant pitch flow
Stalactiform rust (Figs. 8,9)	Cowwheat, Indian paintbrush, and others	Elongate swellings	Elongate, diamond-shaped canker;can be up to 6m long

Figure 2. - Telia of pine-oak rust on

oak leaf.

Figure 3. - Spherical galls of pine-pine rust.

Figure 4a. - Canker and swollen ridges resulting from sweetfern rust infection and host response.

Figure 4b. - Cross-section of sweetfern rust canker.

Figure 5. - Sweetfern.

Figure 6. - Comandra rust canker.

Figure 7. - Uredia on *Comandra* leaves.

Figure 8. - Stalactiform rust canker.

Laboratory Identification

The yellow-orange spores (aeciospores) produced on galls and cankers in the spring are globose to subglobose except for the characteristic snowshoe-shaped aeciospores of the comandra rust fungus as viewed in a compound microscope.

The spherical galls of the pine-oak and pine-pine rusts are very similar in appearance and can only be distinguished by comparing the germinating aeciospores. After the spores have incubated for 24 hours on 2 percent water agar in the dark at 19°C germ tubes of the pine-oak rust fungus are more than 600 M long with few branches at the tips, whereas those of the pine-pine rust fungus are less than 300M long with basal branches.

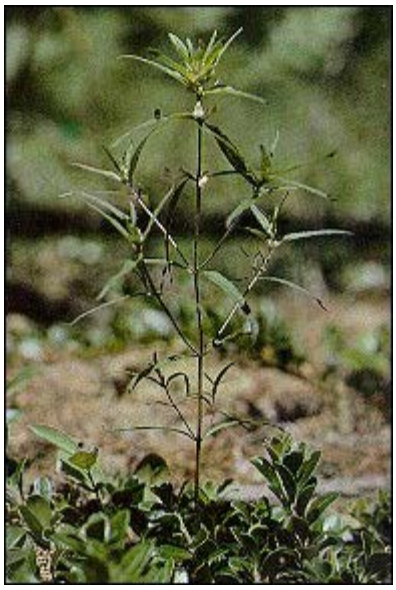

Figure 9. - Cowwheat.

Control

In Nurseries

The rust diseases are controlled in nurseries by spraying seedlings with a protective fungicide. Alternate hosts growing in or near nurseries should be removed. Rust-infected seedlings should not be planted. Research is underway to develop a jack pine that is resistant to stem rusts.

In the Field

Where infections are scattered or light, trees with main-stem infections or with numerous branch infections should be removed during thinnings or other stand-improvement treatments. If infection in a stand is heavy, conversion to another tree species should be considered.

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